

# RESPIRATORY CARE

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### CALCULATION OF OXYMASK FIO<sub>2</sub> BY USING A MODIFIED VERSION OF THE ALVEOLAR AIR EQUATION

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**Background:** The OxyMask (Southmedic Inc, Canada) is an open-designed oxygen mask that, according to the manufacturer's website, is capable producing an FIO<sub>2</sub> of 60-90% at 15 l/m. In this study, we sought to verify that assertion by calculating the mean FIO<sub>2</sub> produced by an OxyMask at 15 l/m using a modified version of the alveolar air equation.

**Methods:** We recruited 15 healthy adults with a mean age of 24 years into our study. All participants were required to be less than 35 years of age, undergo DLCO testing and have a DLCO value of 90% of predicted or greater, be a non-smoker, and have no history of lung disease. Individuals meeting these inclusionary criteria were then seated, placed on a tight-fitting OxyMask at 15 l/m, and were instructed to relax, breathe normally, and not talk for a period of 15 minutes. During the testing period, all subjects were observed to perform quiet, restful breathing. At the end of the fifteen minute period, we performed a radial artery blood gas and measured pH, PaCO<sub>2</sub>, and PaO<sub>2</sub> using a GEM 3000 blood gas analyzer (Instrumentation Laboratories, Lexington, MA). No air bubbles were observed in any of the syringes and all samples were analyzed within five minutes. Assuming that our subjects had normal cardiopulmonary anatomy and physiology, we estimated alveolar PO<sub>2</sub> by dividing arterial PO<sub>2</sub> by a normal arterial to alveolar ratio of 0.9 to reflect a ten percent higher partial pressure of oxygen in the alveoli than in arterial blood. Knowing approximate alveolar PO<sub>2</sub>, we then calculated FIO<sub>2</sub> by the following formula:  $FIO_2 = \frac{[(arterial\ PO_2 \div 0.9) + (arterial\ PCO_2 \times 1.20)] \div (PB - 47)}$ .

**Results:** The mean PaO<sub>2</sub> produced by an OxyMask at 15 l/m in our study was 232 mmHg with a range of 162-291 mmHg. This resulted in a mean calculated FIO<sub>2</sub> of 44% and a standard deviation of 6%. The calculated FIO<sub>2</sub> ranged from 34% to 55%. During the testing period, our subjects had a mean pH of 7.44 and a mean PaCO<sub>2</sub> of 38 mmHg. The average DLCO of the fifteen participants was 116% of predicted.

**Conclusion:** Young healthy persons breathing 60-90% oxygen in Springfield, Missouri (PB